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(54) Abstract Title
Device at a spinning preparation machine for measuring distances between opposed surfaces

(57) A spinning preparation machine, e.g. a carding machine, cleaner or the like, includes a device for measuring spacing between opposed surfaces, in which device a clothed roller 49 co-operates with a counter surface 27[1], e.g. a cover element and/or clothed card top, and in which sensor means 19 is present. An adjusting means 26 is able to alter the spacing b between the roller clothing and the counter surface. In order to detect a change in the spacing in simple manner, the sensor means 19 is positioned opposite the clothing 4a of the roller and is associated with the counter surface 27[1], and the distance to the roller clothing 4a can be detected.

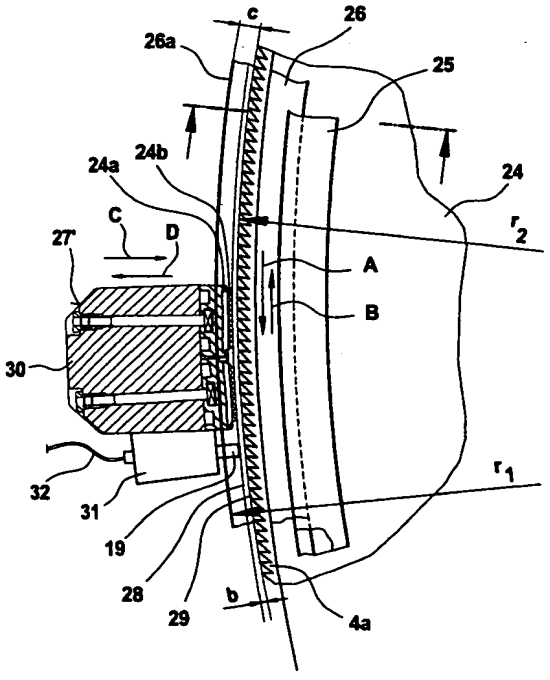

Fig. 3

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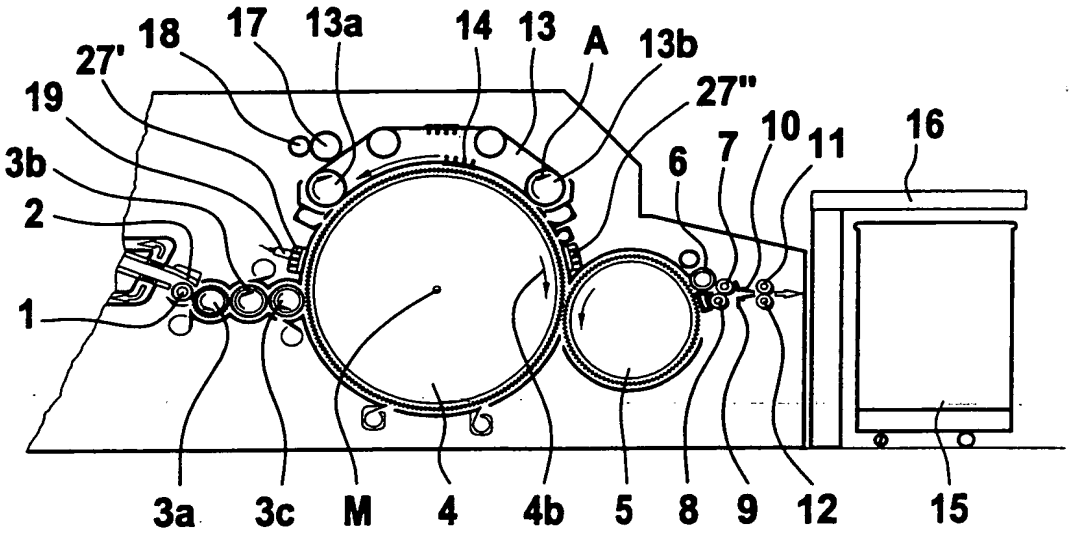
18
17
13a
14
13
A
13b
27'
27"
19
3b
2
1
6
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16
3a
3c
M
4
4b
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8
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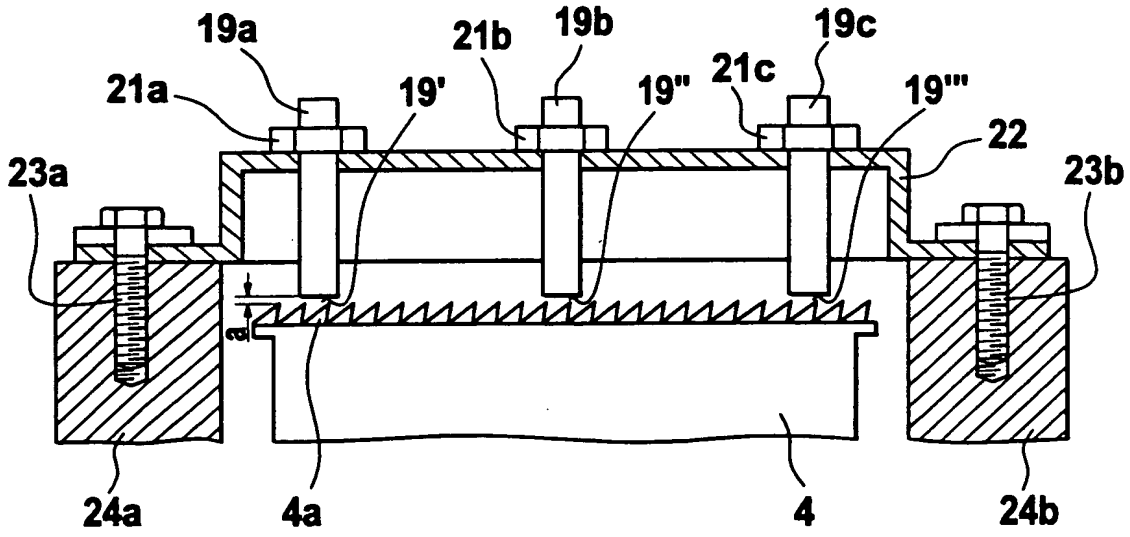
12
15

Fig. 1


19a
21b
19b
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23a
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24b

Fig. 2

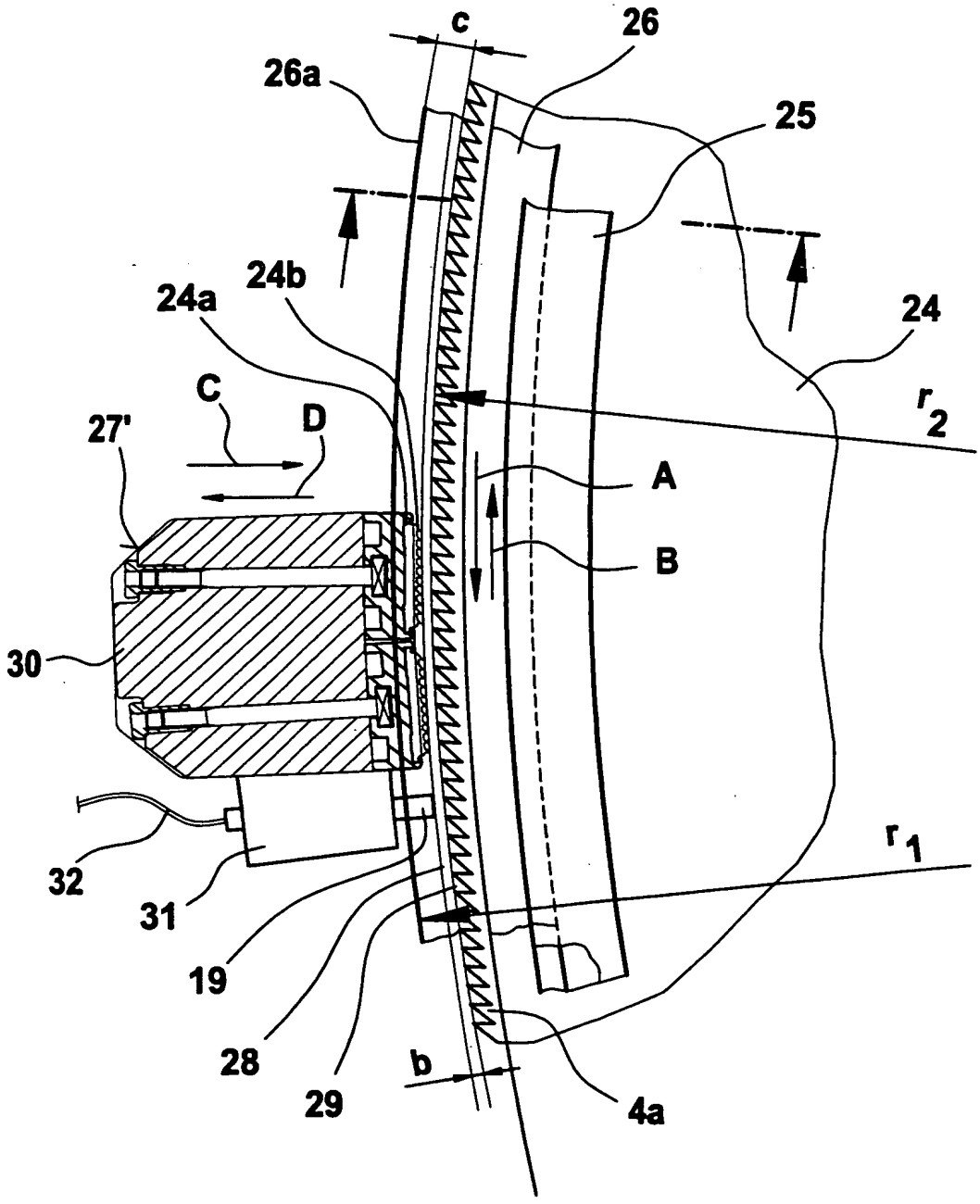

Fig. 3

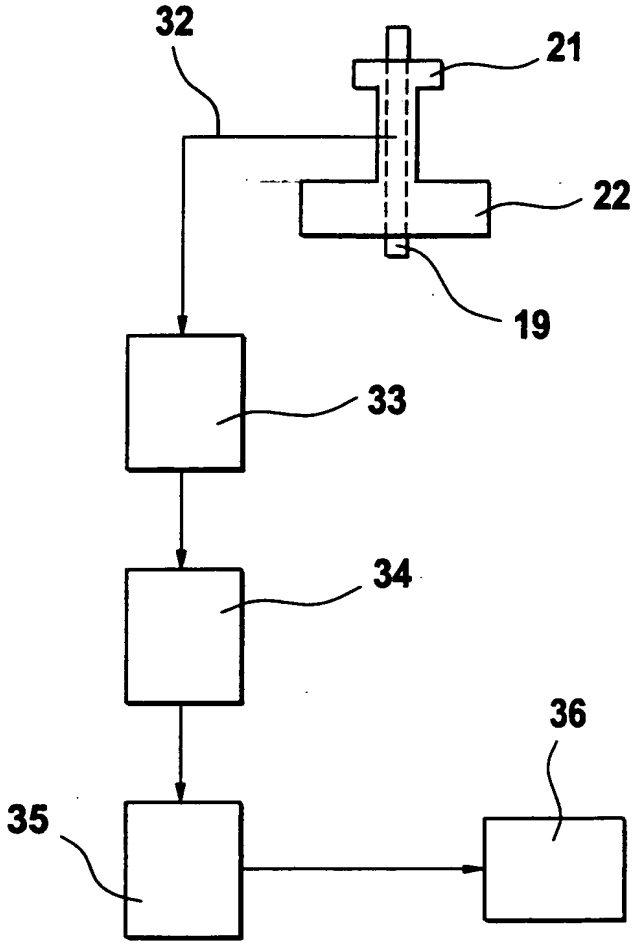

Fig. 4

Device at a spinning preparation machine for measuring distances between opposed surfaces

The invention relates to a device at a spinning preparation machine, for example a carding machine, cleaner or the like, for measuring distances between opposed surfaces.

The distances between the cylinder clothing and those surfaces opposite thereto (counter surfaces) are of considerable significance from a machine and fibre technological standpoint. The carding result, that is to say the degree of cleaning, formation of neps and fibre shortening, is substantially dependent upon the carding nip, that is to say the distance between the cylinder clothing and the clothings of the revolving and fixed card tops. The guiding of air around the cylinder and the discharge of heat are also dependent upon the distance between the cylinder clothing and clothed or non-clothed surfaces opposite thereto, for example separating blades or casing elements. The distances are subject to various, to some extent counteracting, influences. The wear upon clothings facing one another results in a widening of the carding nip, which is associated with an increase in the nep count and with a decrease in fibre shortening. An increase in the rotational

speed of the cylinder, for example to increase the cleaning action, results in an expansion of the cylinder including the clothing as a result of centrifugal force and thus in a reduction in the carding nip. During processing of large amounts of fibre and of particular types of fibre, for example synthetic fibres, the cylinder also expands more, as a result of a rise in temperature, than does the rest of the machine surrounding it, with the result that the distances decrease for that reason also.

The carding nip is influenced especially by the machine settings on the one hand and by the condition of the clothing on the other hand. The most important carding nip of the revolving card top carding machine is located in the main carding zone, that is to say between the cylinder and the revolving card top assembly. At least one clothing that borders the working spacing is in motion, and generally both are. In order to increase the production of the carding machine, it is sought to select the operating rotational speed or the operating speed of the movable elements as high as fibre processing technology will allow. The working spacing lies in the radial direction (starting from the axis of rotation) of the cylinder.

In carding, ever greater amounts of fibre material are being processed per unit of time, which calls for higher

speeds of the working members and higher installed capacities. Even when a working surface remains constant, greater fibre material throughput (production) results in increased generation of heat as a result of the mechanical work. At the same time, however, the technological carding result (sliver uniformity, degree of cleaning, nep reduction, etc.) is continuously being improved, which calls for more operative surfaces engaged in carding and for narrower adjustments of those operative surfaces relative to the cylinder (drum). The amount of synthetic fibres to be processed, in which - in comparison with cotton - more heat is generated by friction in contact with the operative surfaces of the machine, is constantly increasing. The working members of high-performance carding machines are nowadays fully enclosed on all sides in order to meet the high safety standards, to prevent particle emission in the spinning environment and to minimise the need for maintenance of the machines. Gratings or even open material-conveying surfaces that enable air exchange are a thing of the past. As a result of the circumstances mentioned, the amount of heat generated in the machine is markedly increased, whilst the discharge of heat through convection is markedly reduced. The resulting greater heating of high-performance carding machines results in

greater thermo-elastic deformations which, on account of the non-uniform distribution of the temperature field, have an effect upon the adjusted distances between the operative surfaces: the distances between the cylinder and card top, doffer, fixed card tops and separating sites decrease. In an extreme case, the adjusted nip between the operative surfaces can be fully taken up by thermal expansion, with the result that components that move relative to one another will collide. This results in quite substantial damage to the high-performance carding machine affected. Having said all that, in particular the generation of heat in the working region of the carding machine can result in different thermal expansions where the differences in temperature between components are too great.

In practice, the quality of the clothing of the card top bar clothings is regularly assessed visually by a person, with wear resulting in an increase in the carding nip. In a known device (EP 0 801 158) a sensor is provided, by means of which the working distance between carding clothings (also called "carding nip") can be measured, that is to say the effective distance of the tips of a clothing from a machine element positioned opposite to the clothing. The last-mentioned element may also have a clothing, but could alternatively be formed by a casing element having a

guiding surface. The sensor is designed especially for measuring the working distance between the cylinder and the card tops of a revolving card top assembly, wherein the carding distance between the cylinder clothing and the card top clothings is to be detected from the side of the working region by means of an optical apparatus. A disadvantage thereof is that the measurement provides no information as to a change in the width direction. Moreover, the distance between the sensor or counter surface and the roller clothing cannot be measured by that device.

It is an aim of the invention therefore to provide a device that avoids or mitigates the mentioned disadvantages, is able especially to detect a change in the distance in the width direction and in simple manner to detect the distance to the roller clothing, and enables optimum adjustment of the distance.

The invention provides a device for determining spacing between opposed surfaces in a spinning preparation machine, comprising a clothed roller, a counter surface which co-operates with the clothed roller, adjusting means for altering the spacing between the roller clothing and the counter surface, and sensor means positioned opposite the roller clothing and associated with the counter surface,

wherein the sensor means is arranged to detect the distance to the roller clothing.

In accordance with the invention sensor means is associated with a counter surface, for example, a card top bar. Thus, the sensor means is so arranged that it can be positioned on or in the vicinity of the counter surface for determining a distance from a surface of a roller that co-operates with the counter surface.

As a result of the measures according to the invention, it is possible to establish the wear and tear on the roller clothing, for example the clothing of a carding cylinder, especially after a relatively long running time. When there is a change in the distance, the effect of the change in the roller clothing is determined both directly in relation to the wear and indirectly in respect of the clothed or non-clothed counter element, especially wear of the clothing of a fixed carding element and expansion of the counter element as a result of changes in temperature. This enables an optimum adjustment of the distance between the roller and counter element, namely with respect to a target value. Measurement is possible during ongoing operation.

Advantageously the sensor detects the distance between the sensor and the tips of the roller clothing. Preferably the sensor detects the distance between the counter surface

and the tips of the roller clothing. Advantageously the signals from the sensor are used as input values in a controlling and regulating device for regulating the distance between the counter element and the cylinder clothing. Preferably the radial distance (a) between the roller clothing and the counter element can be adjusted by the position and/or shape of a flexible bearing layer arranged between the end portions of the counter elements and a stationary supporting surface of the machine. Advantageously the counter element is a cylinder cover element. Preferably the cylinder cover element is a hollow extruded aluminium section. Advantageously the surface of the counter element facing the cylinder has a carding clothing. Preferably the sensor is able to detect wear of the roller clothing. Advantageously the sensor is able to detect a displacement of the counter element as a result of thermal expansion. Preferably the sensor is able to detect a displacement of the cylinder clothing as a result of thermal expansion and/or centrifugal force. Advantageously the sensor and the adjusting means are connected to an electronic controlling and regulating device. Preferably the electronic controlling and regulating device has a memory for target values for the distance. Advantageously when the target value is exceeded a switching process, a

display or the like is triggered. Preferably the device for adjusting the distance is actuated by manual entry, e.g. push buttons. Advantageously at least one parameter correlating to a change in the working distance, e.g. temperature, is measured to produce a measured value relating to the working distance. Preferably the position of the card top clothing is adjusted in dependence upon the measured value in order to maintain the working distance at a predetermined value.

The invention further provides a device at a spinning preparation machine, for example a carding machine, cleaner or the like, for determining distances between opposed surfaces, in which device a clothed roller co-operates with a counter surface, for example a cover element and/or a clothed card top, and in which at least one stationary sensor means is present and an adjusting means is associated with the counter surface, the adjusting means being able to alter the radial distance between the roller clothing and the counter surface, wherein the sensor means is positioned opposite the clothing of the roller and is associated with the counter surface, and the distance to the roller clothing can be detected. Moreover, the invention provides a method of operating a spinning preparation machine comprising a clothed roller and a counter surface, in which the distance

to the clothed roller is determined by sensor means associated with the counter surface and opposite the roller clothing, and the spacing between the counter surface and the roller clothing is adjusted in dependence on the determined distance.

Certain illustrative embodiments of the invention will be described hereinafter in greater detail with reference to the accompanying drawings, in which:

Fig. 1 is a diagrammatic side view of a carding machine having a device according to the invention;

Fig. 2 shows another embodiment in which a device according to the invention is positioned opposite the clothing of the cylinder of a carding machine;

Fig. 3 is a side view of a fixed carding element together with a device according to the invention; and

Fig. 4 is a block diagram.

Fig. 1 shows a carding machine, e.g. an EXACTACARD DK 803 manufactured by Trützschler GmbH & Co. KG, having a feed roller 1, a feed table 2, lickers-in 3a, 3b, 3c, a cylinder 4, a doffer 5, a stripper roller 6, nip rollers 7, 8, a web-guiding element 9, a sliver funnel 10, delivery rollers 11, 12, a revolving card top 13 having revolving card top bars 14, a can 15, a can coiler 16 and the device according to

the invention (sensor 19). The reference numeral 4b indicates the direction of rotation of the cylinder 4, the reference numeral 4a denotes the clothing of the cylinder 4 and the letter M denotes the central axis of the cylinder 4. The directions of rotation of the rollers are indicated by curved arrows. The carding segment 27' is arranged between the licker-in 3c and the rear card top turning roller 13a, and the carding segment 27'' is arranged between the doffer 5 and the front card top turning roller 13b.

In the embodiment of Fig. 2, three sensors 19a, 19b and 19c are arranged distributed across the width of the cylinder 4, the sensor surfaces 19', 19'' and 19''' being directed towards the clothing 4a of the cylinder 4 at a distance a. Fine screw threads 21a, 21b and 21c enable the adjustment of the distance a relative to the cylinder clothing 4a. The sensors 19a, 19b, 19c are secured in a holding device 22 mounted in a fixed position on the side screens 24a, 24b of the carding machine by means of screws 23a, 23b.

In a further embodiment shown in Fig. 3, at each side of the carding machine there is fastened to the sides of the machine frame (not shown) an approximately semi-circular rigid side screen 24 onto the outside of which there is cast concentrically in the region of the periphery a curved rigid

bearing element 25, which has as supporting surface a convex outer surface and an underside. Above the bearing element 25 is a flexible bearing layer 26, for example made of a slidable plastics material, which has a convex outer surface and a concave inner surface. The concave inner surface rests on the convex surface in a ring-shaped groove and is able to slide in that groove in the direction of arrows A, B. The bearing layer 26 is displaced by a displacement device (not shown), which comprises a drive device, such as a motor, gears or the like. The carding segments 27' have at both ends bearing surfaces which rest on the convex outer surface of the bearing layer 26. Attached to the underface of the carding segment 27' are carding elements 27a having carding clothings 27b. The reference numeral 28 denotes the circle formed by the tips of the clothings. The cylinder 4 has at its circumference a cylinder clothing 4a, for example saw-tooth clothing. The reference numeral 29 denotes the circle formed by the tips of the cylinder clothing 4a. The distance between the tip circle 28 and the tip circle 29, that is, the working spacing, is denoted by the reference letter b and is, for example, 0.20 mm. The distance between the convex outer surface 26a and the tip circle 29 is denoted by the reference letter c. The radius of the convex outer surface

is denoted by r_1 and the radius of the tip circle 29 is denoted by r_2. The radii r_1 and r_2 intersect one another at the centre point M (see Fig. 1) of the cylinder 4. In that manner the carding elements 27' are mounted on the stationary side screens 24a, 24b. The carding segment 27' according to Fig. 3 consists of a carrier 30 and two carding elements 24a, which are arranged in succession in the direction of rotation (arrow 4b) of the cylinder 4, the clothings 24b of the carding elements 24a and the clothing 4a of the cylinder 4 lying opposite one another. Fastened to the side of the carrier 30 is a holding element 31 on which the sensor 19 is mounted. When the distance a between the measuring surface 19' of the sensor 19 and the tips 29 of the cylinder clothing 4a are reduced, for example as a result of thermal expansion of the cylinder 4, or are increased as a result of wear of the cylinder clothings 4a, the sensor emits an electrical signal by way of the electrical line 32, and the signal is evaluated in an electronic evaluating device 33 (see Fig. 4). The electrical signal can be used to adjust or re-adjust a predetermined spacing b (target value) by way of an electronic regulating and controlling device 34 (see Fig. 4). For that purpose, the wedge-shaped bearing layer 26 is displaceable on the inclined groove surface in the direction

A, B, as a result of which, upon displacement, the carding segment 27' is moved in the direction of arrows C, D. The spacing b between the clothings 24b of the carding elements 24 and the cylinder clothing 4a can thus be adjusted precisely and in simple manner.

With reference to Fig. 4, the sensor 19 is connected by way of the line 32 to the electronic evaluating device 33, which displays and stores the values determined. The evaluating device 33 is connected to the electronic carding control device 34, which emits signals for the adjustment means 35 of working elements of the carding machine, which adjusts the carding nip between the clothings 24b of the carding segments 27' and the clothing 4a of the cylinder 4. At the same time, this information is forwarded to the carding information system KIT of a computing and display unit 36, where the data of a complete carding group are monitored.

The invention has been illustrated taking as an example a clothed element opposed to the outer surface of the cylinder 4, the carding segment 17' having the clothing 24b. The invention also includes a non-clothed counter element, for example a cylinder casing element. When the sensor 19 according to Fig. 3 is secured to the counter element and the spacing b is reduced as a result of thermal expansion of

the counter element as well, then, owing to the measures according to the invention, the spacing b will also be detected by way of the measurement of distance a. The carrier 30 and the cylinder casing element can be made of extruded aluminium.

Claims

1. A device for determining spacing between opposed surfaces in a spinning preparation machine, comprising a clothed roller, a counter surface which co-operates with the clothed roller, adjusting means for altering the spacing between the roller clothing and the counter surface and sensor means positioned opposite the roller clothing and associated with the counter surface, wherein the sensor means is arranged to detect the distance to the roller clothing.

2. A device according to claim 1, wherein the sensor means is arranged to detect the distance between a measuring surface of the sensor means and the tips of the roller clothing.

3. A device according to claim 1 or claim 2, wherein the sensor means is arranged to detect the distance between the counter surface and the tips of the roller clothing.

4. A device according to any one of claims 1 to 3, wherein the radial distance between the roller clothing and the counter element can be adjusted by means of adjusting the position and/or shape of a flexible bearing layer arranged between the end portions of the counter elements and a stationary supporting surface of the machine.

5. A device according to any one of claims 1 to 4, wherein the counter surface comprises a cylinder cover element.

6. A device according to any one of claims 1 to 5, wherein the cylinder cover element is a hollow extruded aluminium section.

7. A device according to any one of claims 1 to 6, wherein the surface of an element of the counter surface facing the roller has a carding clothing.

8. A device according to any one of claims 1 to 7, in which the roller is a carding cylinder.

9. A device according to any one of claims 1 to 8, wherein sensor means is able to detect wear of the roller clothing.

10. A device according to any one of claims 1 to 9, wherein the sensor means is able to detect a displacement of the counter surface as a result of thermal expansion.

11. A device according to any one of claims 1 to 10, wherein the sensor means is able to detect a displacement of the roller clothing as a result of thermal expansion and/or centrifugal force of the roller.

12. A device according to any one of claims 1 to 11, wherein the sensor means and the adjusting means are

connected to an electronic controlling and regulating device.

13. A device according to claim 12, wherein the electronic controlling and regulating device has a memory for target values for the distances between a measuring surface associated with the sensor means and the roller clothing and/or the distance between the counter surface and the roller clothing.

14. A device according to claim 13, wherein the arrangement is such that, when the target value is exceeded a switching process, a display or the like is triggered.

15. A device according to any one of claims 12 to 14, wherein the signals from the sensor means are used as input values in the controlling and regulating device for regulating the distance between the counter surface and the roller clothing.

16. A device according to any one of claims 1 to 15, wherein the adjustment means is so arranged that it can be actuated by manual entry, e.g. push buttons.

17. A device according to any one of claims 1 to 16, wherein the arrangement is such that at least one parameter correlating to a change in the working spacing, e.g. temperature, can be measured to produce a measured value relating to the working spacing.

18. A device according to any one of claims 1 to 17, wherein the position of at least an element of the counter surface is adjustable in dependence upon the measured value to maintain the working spacing at a predetermined value.

19. A device according to any one of claims 1 to 18, in which the counter surface comprises card top clothing.

20. A device according to any one of claims 1 to 19, wherein the sensor means comprises at least two sensors, which are spaced from one another across the working width of the counter surface.

21. A device at a spinning preparation machine, for example a carding machine, cleaner or the like, for determining distances between opposed surfaces, in which device a clothed roller co-operates with a counter surface, for example a cover element and/or a clothed card top, and in which at least one stationary sensor means is present and an adjusting means is associated with the counter surface, the adjusting means being able to alter the radial distance between the roller clothing and the counter surface, wherein the sensor means is positioned opposite the clothing of the roller and is associated with the counter surface, and the distance to the roller clothing can be detected.

22. A device for determining spacings between surfaces in a spinning preparation machine, substantially as

described herein with reference to and as illustrated by any one of Figs. 1 to 4.

23. A spinning preparation machine comprising a device according to any one of claims 1 to 22.

24. A method of operating a spinning preparation machine comprising a clothed roller and a counter surface, in which the distance to the clothed roller is determined by sensor means associated with the counter surface and opposite the roller clothing, and the spacing between the counter surface and the roller clothing is adjusted in dependence on the determined distance.

25. A method according to claim 24, wherein the spacing between the roller clothing and the counter surface is determined by means of monitoring at least one parameter related to change in that spacing and calculating the spacing from measurements of the parameter.

26. A method according to claim 25, wherein the parameter is temperature.

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Application No:	GB 0012239.0	**Examiner:**	G R A H A M WERRETT
Claims searched:	1-26	**Date of search:**	14 June 2000

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.R): D1N.

Int Cl (Ed.7): D01G.

Other: Online : WPI, EPODOC, PAJ.

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
X	GB 2272458 A	(TRUTZSCHLER) see e.g. Fig. 2.	1, 21, 24.
X	EP 0801158 A1	(RIETER) see e.g. Fig. 13 & abstract.	,,
X	EP 0627508 A1	(RIETER) see e.g. Fig. 9 & abstract.	,,
X	US 5040272	(RIETER) see e.g. Col. 6, ll 55-59.	,,

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.